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Remote Spin Coupling and Room Temperature Quantum Computation with Diamond Color Centers NORMAN YAO, Harvard University, LIANG JIANG, California Institute of Technology, ALEXEY GORSHKOV, Harvard University, GEZA GIEDKE, IGNACIO CIRAC, Max-Planck-Institut fur Quantenoptik, MIKHAIL LUKIN, Harvard University — We propose an experimentally feasible architecture for a room-temperature solid-state quantum computer utilizing nitrogen-vacancy (NV) defects in diamond as qubits and demonstrate the possibility of high fidelity operations. At an implantation spacing of 20nm, magnetic dipole-dipole interactions are sufficiently strong to enable coherent coupling of qubits. We further investigate remote spin coupling as a candidate for reducing the experimental constraints on such implementations. This approach makes use of a two-dimensional array of nitrogen impurities with sparsely implanted NV center qubits. By utilizing nitrogen impurities to mediate quantum state transfer, it is possible to coherently couple spatially separated qubits using SWAP gate, spin chain, and quantum mirror techniques.

Norman Yao
Harvard University

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